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CODE OF PRACTICE FOR FUMIGATION OF AGRICULTURAL PRODUCE

PART III ALUMINIUM PHOSPHIDE

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CODE OF PRACTICE FOR FUMIGATION OF AGRICULTURAL PRODUCE

PART III ALUMINIUM PHOSPHIDE

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Indian Standard

CODE OF PRACTICE FOR FUMIGATION OF AGRICULTURAL PRODUCE

PART III ALUMINIUM PHOSPHIDE

0. FOREWORD

0.1 This Indian Standard (Part III) was adopted by the Indian Standards Institution on 15 March 1974, after the draft finalized by the Storage and Marketing Structures for Agricultural Commodities Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Use of fumigants becomes necessary for pest control in various commodities including agricultural produce. Fumigants are, however, effective only under airtight conditions and, therefore, airtight condition is a pre-requisite for carrying out the fumigation. Further it is necessary to choose the fumigant taking into consideration the likely reaction of the fumigant with the material to be fumigated, possible hazards to the operators, the area where the fumigation is to be carried out, and the time available for effecting fumigation. For the fumigation operation, not only the operators who are actually going to carry out the fumigation are required to be trained, but they should be fully conversant with the various implication of the operation proposed to be carried out.

0.3 A series of Indian Standards is, therefore, being issued covering the selection, safety, and suitable application techniques of various fumigants. This standard covers aluminium phosphide. It is hoped that adoption of these standards by storage units and export inspection agencies, both in the public and private sectors, will promote efficiency, economy and safety.

1. SCOPE

1.1 This standard (Part III) describes general properties, dosage, duration of exposure, precautions in handling and method of fumigation with aluminium phosphide for pest control in stored agricultural produce and inputs.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS:6151 (Part I)-1971* shall apply.

3. GENERAL DESCRIPTION AND PROPERTIES OF THE FUMIGANT

3.1 Aluminium phosphide is a hazardous inflammable fumigant available in the form of small sachets, pellets or tablets containing phosphine which is slowly evolved by reaction with the moisture in the surrounding atmosphere. The tablets release above 33 percent by mass of phosphine gas. It contains aluminium phosphide and ammonium carbamate or any other base safe for foodgrains and human life. The phosphine gas has a strong typical smell of carbide or garlic.

3.2 Properties of Phosphine Gas

Chemical formula	PH_3
Boiling point	−87·4°C
Freezing point	−133·5°C
Molecular weight	34·04
Specific gravity:	
Gas (air 1)	1·214
Liquid (water 1)	0·746
Latent heat of vaporization	102·6 cal/g
Solubility in water	26 ml/100 ml at 17°C
Lowest explosion point	1·79 percent by volume in air
Method of evolution as fumigant	From the preparations of aluminium phosphide
Odour	Carbide or garlic like

4. DOSAGE AND EXPOSURE

4.1 The recommended dosage of aluminium phosphide is two to three tablets per tonne of grain. For shed fumigation the recommended dosage is 42 g/m³.

4.2 Decomposition of a tablet takes 3 days when the temperature and moisture content of the commodity are high. When the temperature and moisture content of the commodity are lower than 15°C and 10 percent respectively, complete decomposition may take 5 days. The recommended exposure period is 7 days.

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*Storage management code: Part I Terminology.

5. MATERIAL TO BE FUMIGATED

5.1 Aluminium phosphide may be employed with advantage for fumigation of cereals, pulses, milled products and other agricultural commodities like oilcakes, oilseeds, rice bran and seeds.

5.2 Aluminium phosphide may also be employed for fumigation of sheds and rat burrows.

6. AVAILABILITY

6.1 Aluminium phosphide is available in aluminium tubes containing 0·5-g, 1-g and 3-g tablets. The tubes are stoppered with plastic caps to make them airtight. Only aluminium phosphide conforming to IS : 6438-1972* should be used for fumigation of agricultural commodities.

7. METHOD OF FUMIGATION

7.1 Equipment

7.1.1 *Gas-Mask with Suitable Canister Containing Specially Treated Activated Carbon*

7.1.2 *Fumigation Covers with Pulley and Strings*

7.1.3 *Sand Snakes*

7.1.4 *First-Aid Kit*

7.1.5 *Rubber Gloves*

7.2 Fumigation in Stacks

7.2.1 Make the stacks to uniform height. Place the requisite number of tablets depending on the quantity of grain, at definite places fixed earlier. The operators should wear the gas-mask and hand gloves before handling the tablets. Immediately cover the stack or stacks with the fumigation cover and make these airtight by pressing with sand snakes. The operation should be completed within half-an-hour of the placement or exposure of the tablets. After the exposure period of about 7 days (*see* **4.2**), lift the cover partially and allow the aeration for atleast one hour. After an hour remove the cover completely. Allow the stocks aeration of about 6 hours. Aeration should be done wearing a gas-mask fitted with right type of canister or air-hose type mask.

7.3 Fumigation in Godowns

7.3.1 Close the doors and ventilators of the godown and make the structure airtight by pasting them with kraft paper, cardboard, etc.

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*Specification for aluminium phosphide formulation.

If necessary, paste the polyethylene sheets cut to the sizes of door and ventilators on them. Lock from outside all the doors except the exit door. Distribute the required number of tablets depending on the volume of the godown at various points. Allow an exposure period of 7 days and open the doors and ventilators. Aerate for 6 to 8 hours.

7.4 Fumigation in Bulk Storage Structures

7.4.1 Make the bins or other bulk storage structures completely airtight. Insert the required number of tablets at various depths into the agricultural produce to be fumigated by means of a suitable applicator or a special probe. After an exposure of 7 days, open the structure and allow aeration for about 6 hours.

NOTE — In case of fumigation in silos, the tablets may be inserted in the storage bins by placement at regular intervals, on conveyor belts conveying grain into bins.

7.5 Fumigation of Rat Burrows

7.5.1 Carry out the survey of the place where burrow fumigation is to be undertaken. Close all the openings of rat burrows with earth, preferably in the evening. Next morning examine these burrows and find out the number of the burrows reopened. Mark all the reopened burrows as live burrows for fumigation.

7.5.2 Carry out the fumigation of live burrows either in the morning or in the evening then the rats may be resting inside these burrows. Close firmly with earth all the openings except one opening of the live burrows. Insert two 0·5-g tablets deep into each burrow and close the same. Re-examine the burrows the following day. In case any of the burrows have been reopened, repeat the fumigation by increasing the dosage.

8. PRECAUTIONS

8.1 The aluminium phosphide tablets on being exposed to atmosphere start releasing the phosphine gas. The fumigation work should, therefore, be planned in such a manner that the operation of placement of tablets, covering with fumigation covers, closing the doors and ventilators should be completed in about 30 minutes. To ensure uniform and speedy distribution of tablets, the points of application should be decided in advance. Ensure that no person is allowed in the premises within 30 minutes from the beginning of the operation.

8.2 The tablets start crumbling after about 30 minutes of exposure to atmosphere. This should be taken as a warning and as the time limit of completion of the fumigation operation.

8.3 Phosphine reacts with all metals, and specially with copper or copper-containing equipment; especially electrical apparatus may be severely damaged. Therefore, all copper-containing equipment and parts in the godowns or other structures should be protected before the treatment starts.

8.4 The daily exposure to the fumigant of an operator should not exceed 0·3 ppm.

8.5 The operator undertaking the fumigation should invariably wear the gas-mask with a canister containing specially activated charcoal for protection against gases.

8.6 The operator should also wear gloves when dispensing tablets by hand.

8.7 Odour of the fumigant should not be relied upon as an indication of poisonous concentration of the fumigant.

8.8 Smoking or touching food at any time during the application of the fumigant should be strictly prohibited.

8.9 The permissible limit of phosphine in foodgrains shall be 0·1 ppm.

9. SYMPTOMS OF POISONING AND FIRST-AID MEASURES

9.1 Symptoms of Poisoning — Nausea, pain in chest or intestines, diarrhoea, vomitting, fatigue, etc, which may be followed by dry cough, intense thirst, pain in limbs, enlarged pupils, etc.

9.2 First-Aid — Remove the operator out of the contaminated atmosphere into the open air. Make him sit or lie down. Keep him warm, if necessary, with blankets.

9.3 Treatment — Giving oxygen with oxygen breathing equipment is recommended. Administer a cardiac tonic and a drug to stimulate blood circulation.

9.3.1 In case of pulmonary oedema, a hypertonic solution of glucose should be injected.

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IS:	
600-1955	Code of practice for construction of *BUKHARI* type rural food grain storage structure
601-1955	Code of practice for construction of *KOTHAR* type food grain storage structure
602-1955	Code of practice for construction of *MORAI* type rural food grain storage structure
603-1960	Code of practice for construction of underground rural food grain storge structure
607-1971	Code of practice for construction of bagged food grain storage structures (*second revision*)
609-1955	Code of practice for improvement of existing structures used or intended to be used for food grain storage
631-1961	Aluminium food grain storge bins
1497-1959	Layout for regulated market yards for agricultural commodities
1787-1961	Layout for regulated market yards for fruits and vegetables
1788-1961	Layout for regulated market yards for cattle
2059-1962	Layout for regulated market yards for tobacco
3453-1966	Code of practice for construction of hexagonal type concrete-cum-masonry bins for bulk storage of food grains
5503 (Part I)-1969	General requirement for silos for grain storage: Part I Constructional requirements
5503 (Part II)-1969	General requirements for silos for grain storage: Part II Grain handling equipment and accessories
5606-1970	Steel bins for grain storage
5826-1970	Constructional requirements for flat storage structures for grain (capacity above 200 tonnes)
6151 (Part I)-1971	Storage management code: Part I Terminology
6151 (Part II)-1971	Storage management code: Part II General care in handling and storage of agricultural produce and inputs (*superseding* IS: 610-1955 and IS : 611-1955)
6201-1971	Constructional requirements for flat storage structures for grains (100—200 tonnes capacity)
6663-1972	Method for determination of angle of repose of grains
7247 (Part I)-1974	Code of practice for fumigation of agricultural produce: Part I Methyl bromide
7247 (Part II)-1974	Code of practice for fumigation of agricultural produce: Part II Ethylene dibromide
7247 (Part III)-1974	Code of practice for fumigation of agricultural produce: Part III Aluminium phosphide

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